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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/994,534 | 11/27/2001 | James O'Keeffe | STAN.068US0 | 8198 |

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| EXAMINER | |
|---|---|
| ERDEM, FAZLI | |
| **ART UNIT** | **PAPER NUMBER** |
| 2826 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 06/29/2007 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

eleanorcatig@dwt.com
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tracyknox@dwt.com

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/994,534 | O'KEEFFE ET AL. | |
| | Examiner | Art Unit | |
| | Fazli Erdem | 2826 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *21 December 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *2-29,31-34,37,38,40,41,58 and 60* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *22-29,40 and 41* is/are allowed.

6)☒ Claim(s) *2-12,14,15,17-21,31-34,37,38, 58 and 60* is/are rejected.

7)☒ Claim(s) *13 and 16* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Allowable Subject Matter*

1. Claim 22-29, 40 and 41 allowed.

2. Claim 13, 16 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

3. The following is a statement of reasons for the indication of allowable subject matter:

Prior art failed to establish the required optical energy absorption.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 2-12,14,15,17-21,31-34,37,38, 58 and 60 rejected under 35 U.S.C. 103(a) as being unpatentable over Luyken et al. (DE 100 32414) (US 2003/0148562 is used for translation purposes) in view of Avouris et al. (6,423,583).

Regarding Claim 3, in Figs. 5 and 10A, Luyken et al. disclose a nanometer scale apparatus, comprising: an elongated structure with nanometer cross-sectional dimensions; and a device comprising components 105/1005 substantially on opposite sides of the elongated structure 203/1003, said components applying an electric field across them to

the elongated structure in a direction transverse to the elongated structure so that an electronic energy band structure of the elongated structure is modulated without substantially moving any portion of the elongated structure Luyken et al. fail to disclose the required magnitude of the electric field. However, Avouris et al disclose a methodology for electrically induced selective breakdown of nanotubes where in column 5, lines 10-23 the required magnitude of the electric field is disclosed.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required value for the electric field in Luyken et al. as taught by Avouris et al. in order to modulate the nanowire/nanotube 203/1003

Regarding Claim 2, the structure of Luyken et al. is silicon or carbon.

Regarding Claim 4, in Luyken et al., the apparatus of claim 3, wherein said components comprise at least one nanotube or nanowire.

Regarding Claim 5, in Luyken et al., the apparatus of claim 3, wherein said components comprise at least one multiple wall nanotube.

Regarding Claim 6, in Luyken et al., the apparatus of claim 3, wherein said components comprise two elongated nanotubes or nanowires 105/1005 oriented in directions transverse to the elongated structure 203/1003 and applying the electric field to a portion of the elongated structure at a location between and overlapping the two

nanotubes or nanowires of the components, thereby forming a cross junction arrangement with the elongated structure.

Regarding Claim 7, in claims 5 and 6 of Luyken et al, the apparatus of claim 3, further comprising a dielectric material between the components and the elongated structure.

Regarding Claim 8, in Luyken et al, the apparatus of claim 3, wherein said structure comprises at least one multiple wall nanotube.

Regarding Claim 9, in Luyken et al, the apparatus of claim 3, wherein said structure comprises at least one carbon nanotube,

Regarding Claim 10, in Luyken et al., the apparatus of claim 3, wherein said electric field causes change in electrical conductance of the elongated structure by redistributing electrical charge on the elongated structure without changing net electrical charge on the elongated structure.

Regarding Claim 11, in Luyken et al., the apparatus of claim 3, wherein said structure comprises at least one semiconducting nanotube or nanowire.

Regarding Claim 12, in Luyken et al., the apparatus of claim 3, wherein said change in energy band structure also causes a change in electrical conductance of the elongated structure.

Regarding Claim 14, in Luyken et al., the apparatus of claim 3, wherein said components applies the electric field to a section of the elongated structure, so that the change in energy band structure caused by the field also causes a quantum well to develop at or near the section of the elongated structure.

Regarding Claim 15, in Luyken et al., the apparatus of claim 3, wherein said components apply electric field(s) to two or more sections of the elongated structure, wherein said sections are spaced apart from one another, so that the change in energy band structure caused by the field also causes a number of quantum wells to develop at or near the sections of the elongated structure.

Regarding Claim 17, in Luyken et al., the apparatus of claim 3, wherein said components apply the electric field to the elongated structure so that there is an electric field gradient across the elongated structure.

Regarding Claim 18, in Figs. 5 and 10A, Luyken et al. disclose a nanometer scale apparatus, comprising: an elongated structure with nanometer cross-sectional dimensions; and a device comprising components 105/1005 substantially on opposite sides of the

elongated structure 203/1003, said components applying an electric field across them to the elongated structure in a direction transverse to the elongated structure so that an electronic energy band structure of the elongated structure is modulated without substantially moving any portion of the elongated structure. Furthermore, source/drain regions 202/204 are connected to nanowire/nanotube 203/1003. Luyken et al. fail to disclose the required magnitude of the electric field. However, Avouris et al disclose a methodology for electrically induced selective breakdown of nanotubes where in column 5, lines 10-23 the required magnitude of the electric field is disclosed.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required value for the electric field in Luyken et al. as taught by Avouris et al. in order to modulate the nanowire/nanotube 203/1003

Regarding Claim 19, in claims 5 and 6 of Luyken et al, further comprising a dielectric material between the components and the elongated structure.

Regarding Claim 20, in Luyken et al, the apparatus of claim 18, wherein said components comprise two elongated nanotubes or nanowires 105/1005 oriented in directions transverse to the elongated structure and applying the electric field to a portion of the elongated structure at a location between and overlapping the two nanotubes or nanowires of the components, thereby forming a cross junction arrangement with the elongated structure.

Regarding Claim 21, in Luyken et al, the apparatus of claim 18, wherein said components comprise at least one multiple wall nanotube.

Regarding Claim 31, in Luyken et al., the apparatus of claim 3, said structure comprising a crystalline material.

Regarding Claim 32, in Luyken et al., the apparatus of claim 3, wherein said electric field causes a band gap of the electronic energy band structure to become narrower.

Regarding Claim 33, in Luyken et al., the apparatus of claim 18, said structure comprising a crystalline material.

Regarding Claims 34 and 58, in Luyken et al., the apparatus of claim 18, wherein said electric field causes a band gap of the electronic energy band structure to become narrower.

Regarding Claim 37, in Luyken et al., the apparatus of claim 3, said structure comprising a homogeneous material throughout the structure.

Regarding Claim 38, in Luyken et al., the apparatus of claim 18, said structure comprising a homogeneous material.

Regarding Claim 60, electrical terminals, source/drain 201/202 are connected to elongated structure/nanotube nanowire 203/1003.

## *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fazli Erdem whose telephone number is (571) 272-1914. The examiner can normally be reached on M - F 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on (571) 272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

EVAN PERT
PRIMARY EXAMINER

FE
June 8, 2007